

have scarcely any species in common with the shells of San Diego, while in general they agree with those of the West American tropical fauna. They are more nearly related to those of Acapulco and Panama than to those of Mazatlan, although in the same latitude on the opposite side of the Gulf. The presence of such shells as *Oniscia tuberculosa*, *Cassis coarctata* and *abbreviata*, *Lathirus castaneus*, *Oliva porphyria*, *Columbella hamastoma*, *Conus princeps*, &c., several of which are also found at Guaymas, though not at Mazatlan, distinctly points to far more tropical conditions than could have been expected in so high a latitude. The *Trochidæ*, *Patellidæ*, and similar intertidal families, however, bear more near relationship to the shells of Mazatlan; while a solitary, though fine and apparently fresh specimen of *Haliotis splendens*, entirely unknown in the Gulf, serves as a connecting link to the fauna of Lower California.

Catalogue of the Venomous Serpents in the Museum of the Academy of Natural Sciences of Philadelphia, with notes on the families, genera and species.

BY E. D. COPE.

In the cephalic vertebræ of the typical venomous serpents, we observe the greatest modifications of the archetypal vertebra, in the ophidian order. This, which is most excessive in the inferior arches, consists in—

First, the great shortening and thickening of the hæmapophysial element of the nasal vertebra, (superior maxillary,) to serve as a firm foundation for the long curved venom fangs.

Second, its ginglymoid articulation with its neurapophysis (prefrontal), by motion, upon which the fangs are erected or depressed, and—

Third, the great lengthening of the pleurapophysial element of the frontal vertebra, (the tympanic bone), which, acting as a fulcrum, gives the greatest mobility to the articulated pterygoid appendage, the ectopterygoid, and consequently to the superior maxillary.

Thus, it is evident that this modification has immediate reference to the complete specialization, and more perfect exercise of natural functions,—the apprehension of living prey, and its subsequent deglutition.

From the possession of these attributes of high organization, we infer that nature has assigned to the typical venomous serpents the first place in the category of ophidians.

Hence, also, in attempting to define them as a natural group, we look to those points of structure whence we deduce the evidence of superiority.

In the Colubriiform venomous serpents, the hæmapophysis of the nasal vertebra still falls considerably short of its hæmal spine, and is much thickened in a vertical direction at its distal end, to give a firm support to the fangs. But a tendency to revert to the ordinary ophidian type is seen in its posterior elongation, its oblique articulation with the shortened ectopterygoid appendage, and its imperfect articulation with the neurapophysis. In consequence of this structure, the external pterygoid muscle plays upon the maxillary bone at a disadvantage, having, in point of fact, but little power to effect the depression of the fangs. The pleurapophysis of the mandibular arch is shortened. The result of this is, that the pterygoid, articulated to a shorter fulcrum, cannot be drawn forward by the spheno-ptyerygoid muscle to so great an extent; hence much less mobility is given to the dependent ectopterygoid and superior maxillary. Of this group genus *Naja*, (Laur.) offers a typical example; of the first, *Crotalus* (Linn).

Nowhere have we a more conclusive example of the futility of attempting to define higher groups by external characters alone; for, in respect to these, the groups, in question, blend in a manner beyond the possibility of satisfactory separation. There are, indeed, external peculiarities, which are highly characteristic of each. On the one hand there are the depressed, scaly head;

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the perforate fangs; the absence of solid maxillary teeth; the elliptical pupil. On the other, we observe the elevated, plated head; fangs, which, in closing round the poison duct, have not obliterated the line of junction;* the presence of solid maxillary teeth, and the circular pupil. But in the first, many genera have the head more or less completely plated; Daboia (Gray) has a circular pupil. In the latter, Vermicella (Gr.,) Elaps (L.,) Cyrtophis (Sund.,) and Sipedon (Merr.,) have no solid teeth behind the fangs; Dendraspis (Schl.) has perforated fangs, and Acanthophis (Daud.) has the pupil erect and elliptical.

In recapitulation, we characterize as follows the families Viperidæ and Najidæ, adopting the appellations given them by the Prince of Canino, whose genius here perceived that order, "in tracing which the human mind is only translating into human language, the Divine thoughts expressed in Nature in living realities."†

1. VIPERIDÆ.

Essential char. Superior maxillary bone vertical by excessive abbreviation, anteriorly and posteriorly, supporting venom fangs alone; united to the anterior frontal at its upper extremity, and to the ectopterygoid at the lower extremity of its posterior face by ginglymoid articulations. Caudal vertebra normal, without greatly developed processes.

Characters not universal. Tympanic bone much elongated, giving great breadth to the head posteriorly. Fangs having all external trace of the enfolded canal obliterated. Pupil erect, elliptical. Occipital region scaly.

2. NAJIDÆ.

Essential char. Superior maxillary bone horizontal, abbreviated and supporting venom fangs anteriorly; elongated posteriorly, and united to the prefrontal and shortened ectopterygoid by imperfectly moveable articulations. Caudal vertebra normal, without greatly developed processes.

Characters not universal. Tympanic bone shortened, causing the head to be but little distinct from the body. Fangs not perfectly consolidated over the canal. Pupil circular. Occipital region plated.

These families correspond to the Solenoglyphes and Proteroglyphes Conocerques, of Dumeril and Bibron. Though the arrangement of these eminent herpetologists is certainly, in this point, more natural than that of the British Museum catalogue, where the Najidæ (Elapsidæ) are placed among the Colubrine snakes; yet it appears to us that they are in error in not considering the sea-snakes, Proteroglyphis Platycerques, as constituting a group of equal rank with those above defined. They are characterized by numerous external peculiarities, and the compression of the caudal vertebra, and unusual development of their neural and hæmal spines, constitute a modification whose importance may be partly measured by its striking adaptation to a special end in their economy.

3. HYDROPHIDÆ.

Essential char. Superior maxillary bone horizontal, possessing very little mobility; abbreviated, and supporting a grooved fang anteriorly; much elongated posteriorly, and supporting a series of solid teeth. Caudal vertebra compressed, inferior and superior processes much elongated, to serve as a support to the compressed, oar-like tail. Pupil round (?)

Characters not universal. Head not dilated posteriorly; in consequence of the shortness of the tympanic bone. Body compressed; scales not imbricated, nor united into gastrosteges on the belly. Head plated. Nostrils superior, ‡ valvular.

* Termed by herpetologists "grooved," "canneles."

† Agassiz.

‡ P. aturus Daud. is an exception.

In the fetal *Crotalus* the gastrosteges are divided, but they unite into broad shields some time before the young animal bursts its membranous envelope. But it is not until some size is attained that the grooved line where the growing edges of the fang unite and isolate the canal, is obliterated.

Thus we see typified the three families of the venomous serpents, and their relative positions in the scale of being. But these characters, while parallel to those deduced from the skeletal structure, do not, like them, define the groups they characterize.

Those genera of serpents which are characterized by entire urosteges, exhibit a degree of development one step beyond those that have them divided, since the latter retain that arrangement which characterizes the fetal condition of the former.

I. VIPERIDÆ.

1. CROTALINÆ.

Fangs without external groove. Pupil erect, elliptical. Head very distinct. A deep fossa on each side behind the nostrils, partly occupying the excavated, superior maxillary bone.

The genera of this group are here arranged in what appears to be their natural succession, without reference to the position of that which exhibits the highest typical perfection.

	Total species estimated.	Species in Mus. Acad.
A. Vertex symmetrically plated.		
* Urosteges two-rowed.		
Numerous scale-like plates substituted for the frontals,		
Frontals, two pairs, regular.	1. HYPNALE, ?2	1
	2. TRIGONOCEPHALUS, 4	2
** Urosteges, one-rowed.		
Tail terminating in a horny point.	3. ANCISTRODON, 3	3
Tail terminating in a rattle.	4. CROTALOPHORUS, 5	3
B. Vertex, scaled.		
* Urosteges, one-rowed.		
Tail terminating in a rattle.	5. CROTALUS, 12	8
Tail without rattle.	6. TELEURASPIS, 4	2
** Urosteges, two-rowed.		
† Superciliary region plated.		
Urosteges four-rowed at the tip.	7. LACHESIS, 2	1
Urosteges two-rowed to the tip; scales carinated.	8. BOTHROPS, 16	3
Urosteges two-rowed to the tip; scales smooth.	9. PARIAS, 3	0
Superciliary plates, two pairs,	10. MEGERA, 2	0
†† Superciliary region scaled.		
A rudimental superciliary resting on the preoculars.	11. CRYPTELYTROPUS, ?2	1
No rudimental superciliary plate.	12. ATROPOS, 3	1

2. VIPERINÆ.

Fangs without external groove. Head very distinct. Pupil usually elliptical. No lachrymal fossa.

A. Superciliary region scaled.

* Urosteges two-rowed.

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	Total species estimated.	Species in Mus. Acad.
Nostrils lateral; horn-like processes over eyes.		
13. CERASTES,	2	1
Nostrils vertical, surrounded by several nasals; pupil erect.		
14. CLOTHO,*	19	2
Nostrils vertical, each in a single nasal; pupil round.		
15. DABOIA,	3	0
** Urostegea one-rowed.		
Nostrils lateral.		
16. TOXICOA,	3	1
B. Superciliary region plated.		
* Urostegea one-rowed.		
Nostrils lateral.		
17. ECHIS,	2	0
** Urostegea two-rowed.		
Top of head scaled.		
18. VIPERA,	2	2
Top of head plated.		
19. PELIAS,	1	1

3. *ATRACTASPIDINÆ*.

Fangs without external groove. Head not distinct from the body. Gape small. Pupil round. No lachrymal fossa

Head symmetrically plated: urostegea one-rowed: frontal plates, two pairs.	20. ATRACTASPIS,	1	0
Head symmetrically plated: urostegea one-rowed; frontal plates, one pair.	21. BRACHYCRANION,	1	1

4. *CAUSINÆ*.

Fangs with an indistinct external groove. Head moderately distinct. Pupil round. No lachrymal fossa.

Head symmetrically plated; urostegea two-rowed.	22. CAUSUS,	1	1
	Total,	83	34

1. *CROTALINÆ*.

HYPNALE Fitzinger.

Systema Reptilium, 1843, p. 28.

1. *H. nepa nobis*.—*Coluber nepa* Laurenti. Spec. Synopsis Reptilium, p. 97, 1768. *Trigonocephalus hypnale* Boie, Schlegel, et aliorum.

Our specimens agree very nearly with the description of *Trigonocephalus Zara Gray*, Brit. Mus. Catal. of Snakes, p. 15, in the narrow white vitta upon the temporal region, the brown lips with one or two white spots posteriorly, the white band upon the lower part of the neck, etc.; the scales are smooth except a few dorsal rows, which have traces of carinæ. Dr. Gray's description is, however, so brief, that we cannot, with confidence, refer them to it, the more so as no subsequent author notices its existence. Besides, Dr. Gray's species was brought from Singapore. Two spec. Ceylon, Mr. Cuming.

TRIGONOCEPHALUS Oppel.

Rept. p. 50.

a. Scales carinate. *Trigonocephalus*.

2. *T. Blomhoffii* Boie.

Three spec.

Ningpo,

Dr. McCartee.

*It is probable that some of the species assigned by Dr. Gray to *Clotho*, belong more properly to *Cerastes*.

Var. *megaspilus nob.*—Head somewhat broader than usual. Breadth of vertical plate nearly equal to its length. Superciliaries large. Posterior frontals five-sided, not rounded laterally and posteriorly. Temporal region scaled. About twenty large, annular black spots on each side, arranged alternately, and often confluent on the back. These enclose rhomboidal brown spaces, each of which has a central black spot. Gastro- and urosteges black, with a few white variegations. $142 \times 1 \times 46$.

One spec., No. 136. Habitat? Perry Expedition.

b. Scales smooth. *Calloselasma nob.* *Leiolepis* Dum. and Bibr., 1854, not of Cuvier, 1829.

3. *T. rhodostomus* Boie.

One spec.

Java,

Garden of Plants, Paris.

ANCISTRODON Beauv.

Trans. Am. Phil. Soc., iv., 381, 1799. *Cenchrus* Daud., Hist. Rept. 1803. *Toxicophis* Troost, Ann. Lyc., New York, iii., 190, 1833.

M. P. de Beauvois, in characterizing this genus, alluded to the characters by which it may be known from all others, viz: the plated head, entire urosteges, and absence of rattle. Hence his name cannot be set aside for *Cenchrus*, of later date. He spelled it *Agkistrodon*, but according to the universal rule of latinizing the Greek, it should be *Ancistrodon*.

4. *A. contortrix* Bd. & Girard.

Two spec. Foxburg, Penna.,

One " Pottsville,

" " South Carolina,

Two " Mobile, Ala.,

Eight " Kansas,

Three " Loc. ignot.,

Prof. Baird.

C. T. Hughes.

Dr. Holbrook.

Dr. Nott.

Dr. Hammond.

Dr. Wilson.

5. *A. piscivorus nobis.* *Toxicophis piscivorus* B. & G., Smiths. Catal., p. 19.

One spec. Adams Co., Miss., H. Sargent.

Two " South Carolina, Dr. Holbrook.

Two " Loc. ignot., Dr. Wilson and Garden of Plants.

6. *A. pugnax nobis.*—*Toxicophis pugnax* B. & G., Smiths. Cat., p. 20.

Six spec. Texas, Dr. Heermann.

CROTALOPHORUS Gray.

Am. Philos. 205, 1825.

7. *C. Kirtlandii* Holbr. Two spec. Ohio, Dr. Holbrook.

8. *C. tergeminus* Holbr.

One spec. Ohio, Col. McCall.

" " Kansas, Dr. Hammond.

Five " Loc. ignot., Dr. Wilson, *et al.*

9. *C. miliarius* Holbr.

Three spec. S. Carolina, Dr. Holbrook.

One " " Dr. Leidy.

One " Georgia, Dr. Jones.

One " Florida, F. Party.

CROTALUS Linn.

Urocrotalon Fitzinger, Syst. Rept. Schema, p. 29.

Uropophus Wagler, Amphib., p. 176.

The confusion in the synonymy of some of the species of this genus is very great, and is not diminished by the frequent reference of good species by European herpetologists, as varieties of others previously described. Thus in the

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Brit. Mus. Catalogue we find *terrificus* (*adamanteus*;) and *Oregonus* referred to *durissus* (*horridus*;) and Prof. Jan, Rev. et. Mag. de Zoologie, 1859, p. 156, considers *atrox* and *confluentus* as varieties of *terrificus* (*adamanteus*.)

10. *C. durissus* Linn. Syst. Naturæ i., p. 214., 1760, (Stockholm Edit.) "Albo flavoque variis maculis rhombeis nigris disco albis."

Caudisona durissus Laur. Rept. p. 93, 1763. *Crotalus durissus* Merr. Syst. Amphib. p. 156, 1820. Cuvier Règne Animal, p. 122, pl. 32 (of the edit. Audouin, Blanchard, etc.) Griffith's edit. do. ix., p. 267. *Crot. horridus* Latreille iii., 186, do. Daudin, (1803) Wagler, Schlegel, Gray, Dumeril and Bibron. *C. cascavella* Wagler, Spix Serp., Brazil, p. 60, 1824.

The errors introduced into the synonymy of this species and the *C. horridus* of Linnaeus, by Latreille and Daudin, and perpetuated by subsequent writers, have been clearly set forth by Major J. Le Conte, Pro. Acad. Nat. Sci. vol vi. p. 415.

There are four specimens of this formidable serpent in the Acad. Museum, which illustrate very well the changes which age produces in the plates on the muzzle.

No. 141, brought by Dr. Hering from Surinam, is a very young individual, marked precisely as in Règne Animal Reptilia, pl. 32. There are three pairs of plates all closely in contact on the median line, the first subtriangular, the second oval, the third lie partly between the superciliaries.

No. 3. Surinam, Dr. Hering. This is 2 feet $7\frac{1}{2}$ inches long. The plates are as in the preceding, except that the second pair are broader, and concave. The head is rather narrow, resembling fig. 2, pl. 84 bis of the *Erpétologie Generale*. This and the last belong to var. *c* of the Cat. Brit. Mus.

No. 2. Head and tail of a very large individual, Vera Cruz, Dr. Burroughs, the former measuring two inches between the angles of their jaws beneath. Second pair of plates much elongated transversely with some small scales between and around them; of the third pair, one is divided, the other partially; and there are small scales between them and the superciliaries.

No. 1. Surinam, Dr. Hering. Length four feet five inches. First pair of plates entire; second, divided into three on each side; third, small, in consequence of irregular subdivision.

11. *C. terrificus*. *Caudisona terrificus* Laurenti Rept. p. 93, 1763. *Crotalus rhombifer* Daud. v., p. 325, 1803. Dumeril and Bibron, 1854. *Crotalus adamanteus* Beauv., Trans. Am. Phil. Soc. iv., p. 368, 1824. Holbrook, Amer. Herp. iii. p. 9, 1842. Baird and Girard, Cat. Smiths. Inst., p. 3, 1853.

One spec. South Carolina, Dr. Holbrook.

12. *C. atrox* Bd. & Girard.

Three spec. Texas, Dr. Heermann.

13. *C. lucifer* B. & G.

One spec. S. California, Smiths. Institut'n.

14. *C. oregonus* Holbr.

One spec. Oregon, T. Nuttall.

15. *C. cerastes* Hallowell.

One spec. California. D. Heermann.

16. *C. confluentus* Say. p. 180.

Fifteen spec. Kansas, Dr. Hammond.

Three " Rocky Mountains, "

" " California, Dr. Heermann.

One " New Mexico, Dr. S. Woodhouse.

C. Lecontei was stated to differ from *C. confluentus* in possessing two rows of scales between the suborbitals and superior labials instead of four; in having a row of four scales between the nasals instead of six; in the less number of longitudinal rows on the body, the absence of a white border to the rostral plate, etc. Examination of the above specimens shows that the number of scales in 1859.]

the rows between the nasals varies from two to four in the first, from four to six in the second; that the number of rows of supralabials varies from two to three; the rows of scales on the body vary from 24 (the number attributed to *Lecontei*) to 26; that the rostral plate is often half bordered, sometimes not at all.

17. *C. horridus* Linn. Syst. Nat. i. p. 214, Edit. 1760. Cuvier, Règne Animal, ii. p. 78, 1817. *Crotalus durissus* Daud. Hist. Rept. v. 304, 1803. Also of Holbrook, Dumeril and Bibron, Baird and Girard. *Crotalus atricaudatus* Daudin and Wagler. *Uropsophus durissus* Gray, Cat. Brit. Mus. *Urocrotalon durissus* Fitzinger, 1843.

Nine spec.	Penna.	Drs. Mitchell and Rand, and Mr. J. H. Slack.
One	New Jersey,	Dr. Coleman Pemberton.
"	Kansas,	Dr. Hammond.
"	Louisiana,	Dr. P. B. Goddard.
"	Benton Co., Miss.,	" "
"	S. Carolina,	Dr. Holbrook.
Ten	Loc. ignot.	Dr. Wilson, et al.

No. 47 (Penna.,) dark variety. The black double rhombs become confluent upon the plants anteriorly, enclosing the lighter ground, which thus forms a series of oblong spots. Posterior rhombs all confluent into transverse black bands. Gastrosteges clouded with brownish black. Nos. 48 and 49 are intermediate between this and the ordinary variety.

The remaining species of this genus are:

C. molossus B. & G., Catalogue Serp., Smithson. Inst. p. 10. A very distinct species.

C. ornatus *Hallowell*, Pacific Rail Road Report, x., Parke's Explorations p. 24.

C. tigris *Kennicott*, U. S. and Mex. Boundary Survey Reptiles, p. 12, pl. 4.

C. lugubris *Jan*, Rev. et. Magasin de Zoologie, 1859, p. 156. This seems to be most nearly related to *C. lucifer* B. & G.

TELEURASPIS nobis.

Head triangular, depressed, covered above with small scales. Muzzle prominent, bordered by a series of small scales; a large superciliary plate on each side as in *Bothrops*. Urosteges one-rowed; tail without rattle.

The absence of a rattle distinguishes this genus from *Crotalus*, and the entire urosteges from *Bothrops*. Its natural situation appears to be between them. The two species which we have seen are both small and widely different from each other.

18. *T. Schlegeli nob.*—*Trigonocephalus Schlegeli* Berthold, Abhandlungen der Königlich Gesellschaft der Wissenschaften zu Göttingen, iii. p. 13, 1847. Jan, Rev. et Mag. de Zoologie, 1859, p. 155.

Two Spec. Cocuyas de Veraguas, N. Granada. Mr. R. W. Mitchell.

Since the time of its description in 1847, this rare and curious serpent has been, as far as we are aware, unnoticed by authors. As Berthold's description is brief, we subjoin the following:—

Snout rounded, depressed, its plane forming an acute angle with that of the rostral, which is slightly concave. Scales on the head tuberculous or carinate, as are also the supralabials and temporals,—the latter excessively. A series of small tuberculous scales between the superciliary and orbit, two of which are prolonged into compressed horn-like appendages, which are erect and flexible. Scales bordering the muzzle with their outer borders free and recurved. Nasal plate large, the nostril pierced in the centre. Lachrymal fossa large. A slender undivided subocular. Superior labials nine, the third longest; eye over third and fourth. Inferior labials thirteen. Genial scales imbricate, acute, some of them carinate. Scales of the body thin, acute, much imbricate, in 24 or 25 longitudinal rows, all carinate except those next the gastrosteges.

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No. 99. Bright green with a few dark brown rhombs on the back. On the posterior part of the body, narrow pinkish grey bands, alternate on opposite sides of the median line. The whole upper surface sparsely dotted with brown punctulations. Upper surface of head with two deep brown spots on the muzzle; one on the inner border of each superciliary; a large one on the vertex, with a smaller confluent with it on each side, and two occipital spots. A dark band passes from the orbit beyond the angle of the mouth. Inferior and superior labials white, punctulated and spotted with brown. Beneath, white, shaded with cream color, (in spirits); posteriorly green; the whole punctulated with brown. A series of brown spots on the flanks, which shade the extremities of the gastrosteges.

No. 98 differs in having fewer brown rhombs on the back; and the light transverse vittæ extend to the anterior part of the body. The top of the head is uniform brown, without spots, except the occipital pair. Gastrosteges 151; anal 1, entire; urosteges 52. Length 1 ft. 3 in.

19. *T. Castelnaui nob.*—*Bothrops Castelnaudi* D. & B. vii. p. 1511.

Three spec. South America. Mr. Cuming.

This species has two nasal plates, with the nostril between them. The superciliary plate rests immediately upon the orbit.

Var. *brachytoma nob.*—In this variety the breadth of the head at the angle of the jaws is only two-fifths its length, which is perhaps the result of accident. The labials are 8 above and below, instead of 10 superior and 9 inferior. The brown spot on the head is quadrangular, not cordate; and the labials above and below, and the genicals, are brownish black. In other respects it is exactly similar to the true *Castelnaui*. Longitudinal rows of scales 23. Scuta 154×1×33.

One spec. Habitat? Mr. Cuming.

T. Lansbergii is a third species of this genus. We have not been able to find the original description, but its prominent characters have been pointed out by Prof. Jan, loc. cit. p. 155. *T. nummifer*, (*Trig. nummifer* Rüppel) is probably a fourth species. There is a possibility, but we have not the means at hand for arriving at a decision, that this is identical with *Atropos mexicana* Dum. and Bibr. Vol. vii. p. 521, which has the urosteges entire, and, according to the plate 83, bis. *Erp. generale*, a small superciliary shield. The latter at least can hardly be considered as congeneric with the *Atropos Darwini* and *punicus*.

LACHESIS Daud.

Hist. Rept. 1803. *Cophias* Merrem, 1820.

20. *L. mutus* Daud. Two spec. Surinam, Dr. Hering.

BOTHROPS Wagler.

In Spix. Rept. Brazil, 1824, p. 50. *Craspedocephalus* Kuhl (18?) Fitzinger (1843); Gray (1849.)

21. *B. lanceolatus* Wagl. Two spec. S. America.

22. *B. atrox* Wagl. *B. leucurus* and *teniatus* Wagl. *Trigonocephalus colombiensis* Hallow. Proc. Acad. Nat. Sci. ii. p. 246.

Eight spec.	S. America,	Mr. Cuming.
Two "	Cocuyas de Veraguas, New Granada.	Dr. Mitchell.
Five "	Caraccas,	Dr. S. Ashmead.
One "	"	Dr. Morris.
One "	Para,	Col. Abert.
Two "	loc. ignot.	Prof. Bache.

23. *B. alternatus* D. & B.

One spec.	Buenos Ayres,	Mr. Kennedy.
One "	loc. ignot.	?

B. viridis connects the South America and East Indian species inseparably; and to us it appears questionable whether *B. sumatranus* and *Hombromii* are generically distinct.

CRYPTELYTROPUS nobis.

Head very distinct, depressed anteriorly, covered with small smooth scales. Superciliary region covered with small scales, not thickened as in *Atropos*. Superciliary plate narrow, rudimentary, resting on the preoculars. Pupil elliptical. Urosteges two-rowed.

24. *C. carinatus nob.*—*Trimesurus carinatus* Gray, Zoological Miscellany, p. 48.

One spec.

Hab. ? (Probably India)

?

To Dr. Gray's very brief description we add the following:—Body rather slender, tail moderate. Scales in 25 longitudinal rows, lanceolate, strongly carinate, except a row on each side adjacent to the scuta. Temporals small, keeled. Superior labials small posteriorly, the third largest; eye over the fourth and fifth, from which it is separated by three rows of scales. Gastrosteges 157. One entire anal. 77 Urosteges. Above, dark olive brown; beneath blackish green; a greenish white oval apical spot upon each scale of the smooth series next the scuta on each side.

Trimesurus albolaris Gray, loc. cit., may be a second species of this genus, which intervenes between *Bothrops* and *Atropos*.

ATROPOS Wagler.

Nat. Syst. der Amphib. p. 175.

25. *A. Darwini* D. & B.

Two spec.

Hab. ?

Dr. Wilson.

In this very vicious looking species all the scales are smooth except a few dorsal rows. No. 100; gastrosteges 165; anal 1, entire; urosteges 51. No. 101; $163 \times 1 \times 53$. Prof. Jan (Rev. et Mag. Zoologie, 1859, p. 157,) has described a third *Atropos*, which has a long horn-like appendage over each eye. This peculiarity, formerly known only in the *Cerastes* and *Clothos* of the old world, characterizes three species of American *Crotalidæ*, viz:—*Crotalus cerastes* Hallow, *Atropos undulatus* Jan, and *Teleüraspis Schlegelii nob.*

2. VIPERINÆ.

CERASTES Wagler.

L. c. p. 178.

25. *C. Hasselquistii* Gray, Zool. Misc. 1832. *Coluber cerastes* L. Syst. Nat. 1766. *Cerastes ægyptiacus* D. & B. vii. p. 1440, 1854.*

Two spec.

North Africa,

Dr. Wilson.

CLOTHO Wagler.

Gray Zool. Misc. 69, 1842. *Echidna et Cerastes pars* Wagler, Amphib. 177, 78, 1830. *Echidna* Dum. and Bibr. (not of Merrem,) vii. 1420, 1854.

27. *C. rhinoceros*.—*Cerastes nasicornis* Hallow. Proc. Acad. Nat. Sci. Phila. iii. p. 319. *Vipera rhinoceros* Schlegel, Verslagen en mededeelingen der Koniglijke Akadademie von Wetenschappen; Amsterdam, iii. p. 316.

Three spec.

Gaboon,

Dr. Henry A. Ford.

In No. 154 (large specimen), there is on the muzzle, below and in front of each horn-like supranasal, an oval scale, directed outward and upward, and free for the greater part of its length. In No. 155, (still larger specimen,) this scale is produced into a horn, four lines in length. The scales of the head are more strongly carinate and spinous in this than in the last. In *C. nasicornis* Gray, the horns are all developed from the *supranasal plate*, which is the character by which Schlegel distinguishes it.

* *Aspis Cleopatrarum Laurenti*, Specimen p. 105, cannot be this species, He says, "squamis planis appressis nec carinatis."

28. *C. arietans* Gray.

One spec.	Senegambia,	John Cassin, Esq.
One "	Cape of Good Hope,	Garden of Plants.
One "	" "	U. S. Exp. Expedition.

This is the type of *Bitis* Gray, in which the supranasal is not developed into a horn. Corneous and squamous appendages are, however, common among the vipers, and occur independently of generic characters. The position of the nostrils and the number of nasal plates are the same in this and the last species.

Echidna (Merrem, 1820) is employed by some authors to designate this genus, but as its type, *E. cobra*, (Merrem, *Systema Amphib.* p. 150), cannot be identified,* Dr. Gray adopts *Clotho* (Wagler.)

Toxicoa Gray.

Cat. Brit. Mus. 1849. (Type *Echis arenicola* Boie.)

29. *T. squamigera* nob. *Echis squamigera* Hallow., Proc. Acad. Nat. Sci. Phila. vii. p. 193.

One sp. Gaboon. M. Duchailu.

Tox. chloroëchis (*Vipera chloroëchis* Schlegel, *Verslag. der Koniglijke Akad. Amsterdam*, iii., p. 317, 1855) is allied to this species, but differs in having 23 rows of scales instead of 18; 13 inferior labials instead of 10; and in having "on each side of the back one row of small spots of a light yellow color," instead of irregular transverse fasciæ of the same.

VIPERA Laurenti.

Specimen Synopsis Rept. 99.

30. *V. ammodytes* Daudin.

One spec. Italy. Dr. Wilson.

31. *V. aspis* Merr.

Thirteen spec. Italy. Dr. Wilson.

Var. *ocellata* Bp.

Five spec. " "

Var. *rufa* Bp.

Three spec. " "

Var. *fusca* Bp.

Three spec. " "

Var. *nigra* Bp.

Two spec. " "

PELIAS Merr.

Syst. Rept. 148.

32. *P. berus* Merr.

One specimen. Loc. ignot. Garden of Plants.

Four " Italy. Dr. Wilson.

Three " Lund, Sweden. J. & H. Rinberg.

Two " (young.) Italy. Dr. Wilson.

A half grown specimen, from Italy, has the short muzzle of the variety *Ursinii* Bp., with the ordinary dark coloring.

Var. *niger* Bell. (♂)

Two spec. Lund, Sweden. J. & H. Rinberg.

Var. *dorsalis*. (*P. dorsalis*, Gray. *Zool. Misc.*, p. 71.)

One spec. Lund, Sweden. J. & H. Rinberg.

Our specimen is not typical of the variety, as the dorsal band—which is eight scales wide—is undulate on the margin, thus approaching the ordinary variety. The muzzle and gape is shorter than usual, thus resembling *Ursinii*.

* His description, "*Squamis maioribus in carina dorsi*," is, at least, not applicable to any of the true vipers.

Var. *Ursinii* Bp. *Pelias chersæa* vel *Ursinii* Bp. Fauna Italica.

One spec.

Italy.

Dr. Wilson.

The gape and muzzle are shorter, and the latter more sloping than usual. In its light colors, our specimen partakes of the character of a young animal. Many specimens of this strongly-marked variety, and much observation on it in a state of nature are needed to settle satisfactorily its true zoological value. Until proof to the contrary can be adduced, we cannot consider it as more than a variety. How far it coincides with the *Coluber chersæa* of Linnaeus is a question.

3. *ATRACTASPIDINÆ*.

BRACHYCRANION Hallowell.

Proc. Acad. Nat. Sci., vii. p. 99.

Differs from *Atractaspis* (Smith, Zool. S. Africa, facing pl. 71) in possessing one pair of frontal plates instead of two.

In this genus the tympanic bone is short; but in other respects the mechanism of the bones of the mouth is similar to that of the vipers and rattlesnakes. The superior maxillary bone is very short and vertical, articulating with the lachrymal by a ginglymoid joint at its superior extremity. Its whole lower surface is occupied by the anchylosed bases of the fangs. The ectopterygoid articulates with it moveably, and at a right angle, but is rather short, and incurved posteriorly. While this structure gives its possessor the power of erecting or depressing the fangs, weakness is indicated by the proportions and form of the ectopterygoid and tympanic bones, and by the small size of the sphenoid and external pterygoid muscles. The former is not larger than in an adult *Tropidonotus sirtalis*. Though the gape of the mouth in Dr. Hallowell's species is small, the fangs are probably as efficient as in some species of *Elaps*, which, it has been shown by the experiments of Dr. Cantor, are unable to inflict a wound on any but very small objects.

33. *B. corpulentum* Hallowell. *Atractaspis corpulentus* Hallow. Proc. Acad. Nat. Sci. 1857, p. 70. Günther, Cat. Colubr. Brit. Mus. p. 239.

One spec.

Gaboon.

Dr. H. Ford.

4. *CAUSINÆ*.

Causus Wagler.

Natur. Syst. Amphib. 172.

While this genus exhibits a close conformity to the succeeding group in external characters, it maintains that modification of the cephalic vertebræ which we deem characteristic of the highest family of Ophidians, the true venomous serpents.

Thus it is that, while this group (*Viperidæ*) may be distinctly defined by that modification of the ideal by which the neuro-skeletal structure is adapted to an end in the economy of the animal, those external peculiarities which are of no obvious value to their possessors connect it inseparably with that succeeding, and add another to the many proofs that the works of Creation form a graduated and connected whole.

34. *C. rhombæatus* Licht.

One spec.

Cape of Good Hope.

Garden of Plants.

Four.

Liberia.

Dr. Goheen.

II. *NAJIDÆ*.

1. *NAJINÆ*.

Fangs with an external groove, extending from the basal to the terminal orifice.

ACANTHOPHIS Daudin.

Hist. Rept. v. p. 289, 1803.

[Dec.

35. *A. antarctica* Wagler. *Boa antarctica* Shaw. *Acanthophis cerastinus*, Daud. Hist. Rept. 1803.

Superior maxillary bone elongated posteriorly, not compressed, rounded on its outer face; the ectopterygoid curves inward and articulates with it obliquely. The fang is long, with a delicate groove on its anterior face, extending from the basal to the terminal orifice. Behind it there are two small greatly recurved solid teeth, the last upon the very edge of the articulation with the ectopterygoid, and both are concealed by the integuments.

In an undoubted and beautiful specimen of this snake, received from the Garden of Plants, Paris, these characters are distinct. Hence we feel assured that its true position is in the family Najidae, and that Pseudechis and Hoplocephalus are its natural allies. Thus, while so large a proportion of Australia's mammals are Marsupials—her birds, Raptores, Psittaci and Cursores; her mollusca, Brachiopods; her lizards, Scinks, etc.—her venomous serpents are all Najidae; nor has she a solitary example of the higher Viperidae.

HOPLOCEPHALUS, Cuvier.

Règne Animal, ii. p. 95. *Alecto*, Dum. & Bibr. 1854. (Not of Wagler, 1830, the type of whose genus is *Trimeresurus leptcephalus*, Lacep.)

36. *H. pallidiceps* Gray (?) var.

Scales in fifteen longitudinal rows. Superior labials six, second and third truncated above. Two inferior labials in contact with the inframaxillaries, (three in curtus.) Row of scales next the scuta yellow at their bases, more conspicuous anteriorly. Beneath, yellowish olive, more yellow anteriorly. Head above, uniform deep olive brown; the vertical plate is nearly as broad as long, and much depressed. The muzzle is broad and rounded. Body above deep olive brown. Where the epidermis is lost, olive-yellow transverse bands, about two half scales in width, alternating with the darker, which occupies a width of one scale and a half, appear, but they are very indistinct; obsolete anteriorly.

One spec. Australia. Gard. of Plants. (As *Alecto cuta*.)

Our specimen approaches very near to the *pallidiceps* Gray, but its identity cannot be established without additional examples.

SEPEDON Cuvier.

R. An. ii., 86.

37. *S. hæmachates* Merrem.

One sp. Cape of Good Hope. Garden of Plants.
One sp. " " Dr. Wilson.

NAJA Laurenti.

Specimen, p. 90.

38. *N. haje* Merr. One sp. Garden of Plants.
Var. *melanoleuca* Hallowell. Four sp. Gaboon. Dr. H. A. Ford.

39. *N. tripudians* Merr. Var. with the spectacle-like marks.

One sp. Bengal. W. Jones.
Three sp. ? ?

Var. uniform brown, without the spectacle-like marks.

One sp. Java. Dr. Ruschenberger.

Var. *scopinucha* nob.—Light brown, annulated with narrow white rings, which are not continued upon the pale brown belly. Throat nearly white, with a black annulation covering from the fourteenth to the seventeenth gastræges. The back of the neck black, with a white circle, emarginate in front, and having a central black spot, with a small dot on each side of it.

One sp. Canton River. Dr. W. S. W. Ruschenberger.

A specimen nearly similar to this singular variety, brought from China by Mr. Gernaert, came under the notice of the authors of the *Erpetologie Generale*, and is described vii., p. 1297.

BUNGARUS Daudin.

Hist. Rept. v., 263.

40. *B. semifasciatus* *Kuhl.*
 One sp. Java. Dr. Ruschenberger.
 One sp. ? ?
41. *B. fasciatus* *Cantor.* Var. *B.* (Brit. Mus. Catalogue.)
 Three sp. Ceylon. Mr. Cuming.
 One (young) sp. " "

ELAPS Schneider.

Hist. Amphib. ii., p. 289.

a. Asiatic.

42. *E. calligaster* *Weigmann.*
 One sp. Philippine Is. Mr. Cuming.
b. African.

43. *E. lacteus* *Schn.* (*Coluber lacteus* L. 1754. *Col. Hygia* Shaw, 1792.
Elaps Hygia, Merr. 1821.)
 One sp. Cape of Good Hope. Garden of Plants.
c. American.

*Body with complete isolated rings, with spots between them.

44. *E. fulvius* *Cuv.*
 One sp. Dr. Bacce.
 One sp. Charleston, S. C. Smithsonian Inst.
 Four sp. ? ?
 One sp. South Carolina. Jas. Reade.
 One sp. " Dr. Blanding.
 One sp. Texas. Dr. Heermann.

45. *E. aglæope nobis.* Head slightly distinct from the body, oval, muzzle elliptically rounded. Not a slender species. Tail long, one-seventh of the total length.

Rostral plate small. Anterior frontals very small; posterior frontals nearly as broad as the length of the vertical, and a little longer than the superciliaries. Vertical small, two-fifths of its length between the occipitals. Scales in fifteen longitudinal rows. Rings black, three scales (in a straight line,) and three or four gastrosteges in width. Spaces between, five or five and a half scales wide, with a delicate light brown ground color, but divided by a vermilion ring, three scales wide. This is wider on the belly and adjacent to the black, except when occasionally separated by a yellow gastrostege. In the middle of the vermilion is a series of elongate black spots one scale wide, sometimes confluent into a band, not reaching the gastrosteges. A black collar involves the tips of the occipitals, half the last superior and inferior labial, and the first three gastrosteges. In front of this a band of delicate brown includes the occipitals and extends to the labials; the latter are yellow. The inferior labials (except a black spot on the second and third,) and the inframaxillaries, are also yellow. The rostral, and anterior frontals are brownish yellow, (perhaps shaded with red in life). The rest of the head, extending backward from the first and second superior labials, to the postoculars, and anterior edge of occipitals, is black. There is a spot of the same color on the line between the occipital plates.

Gastrosteges 207, anal one, urosteges 52, first seven undivided.

Total length 31 inches. Tail 4 inches, 6 lines.

One specimen, brought by Dr. Jno. L. Le Conte from Honduras.

A beautiful species, related to *fulvius*, *apiatus*, *tener*, etc.

**Body with rings at equal distances, without spots between.

46. *E. circinalis* *D. & B.*
 One sp. West Indies. Mr. Engstrom.
 Two sp. ? ?

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In one of our specimens all the rings are complete, in another several are incomplete, appearing as elongate oval spots bordered with yellow, and in the third, as many as five successive rings are wanting on the gastrosteges. This appears to be a smaller and darker colored species than *corallinus*, of which some consider it a variety.

47. *E. corallinus* *Newwied.*
Two sp. South America. ?

48. *E. nigrocinctus* *Girard*, Proc. Acad. Nat. Sci., vii., p. 226, 1854??
U. S. Astronomical Exped. ii., p. 210. Aug. 1855. *E. divaricatus*, Hallow. Jour. Acad. Nat. Sci. iii., p. 36, May, 1855.

Three sp. Honduras. Dr. J. L. Le Conte.
Two sp. Panama. "
One sp. Nicaragua. Mr. Amory Edwards.

The coloring of the body of this species is that of *corallinus*, while the head has that of *fulvius*.

***Rings complete, arranged three and three.

49. *E. altirostris*, *nobis*. Head scarcely distinct, lanceolate, compressed, its height and breadth at the eye equal. Muzzle rounded, narrow, high, prominent. Cephalic shields large; superior labials seven, high; the eye resting on the division line of the third and fourth. Tail short, (possibly mutilated,) one eighteenth of the whole length.

Scales in fifteen rows.

Colors in spirits. Body with fourteen triads of complete rings of a deep chocolate brown, sometimes confluent on the belly. Spaces between these four or five scales wide, of a pale yellow brown shade, each scale tipped with darker. Spaces between outer and central rings of the triads covering two scales, which are broadly tipped with chocolate. The color of the head is a continuation of that of the anterior outer ring of the first triad. The following, however, are the markings of white: The occipitals (except the outer borders) and plates surrounding them; the anterior borders of the inframaxillaries and inferior labials; a line bordering the fifth superior labial above, and reaching to the occiput.

Gastrosteges 194; anal 1, divided; urosteges 15. Length 29 inches, 6 lines; tail 1 inch, 5 lines.

One sp. ? ?

A robust species, resembling *E. lemniscatus*, except in the color and form of the head. In respect to the latter, it differs from any other species which we have seen, but resembles the figure of *E. Bertholdi*, Jan. loc. cit., except in the absence of the preocular.

50. *E. dissolucus* *nobis*. Head slightly distinct, muzzle acutely rounded and projecting. Body not slender, not stout. Tail distinct, tapering, short, one-eighteenth of the total length.

Vertical plate small, elongate, obtuse behind; superciliaries broad; occipitals very elongate; eyes very small. Scales fifteen rows. Body red, with seven sets of three black rings together; the central ring not twice as wide as the exterior ones, and separated from them on each side by ring of white, four scales wide; each white scale bordered with black. Viewed from above the head, and for four scales behind the occipital plates is black, except a band of red, which includes the fifth, sixth, and most of seventh superior labials, nearly all the postoculars, anterior part of the occipitals, but not extending across the median line, which is black. On the throat and chin the black only appears on three gastrosteges, and the front inferior labials.

Gastrosteges 200; anal 1, divided; urosteges 19. Length 22 inches, 6 lines; of tail 1 inch, 4 lines.

One sp. Venezuela. Dr. Chas. D. Meigs.

One of the most elegant species of the genus, and having some similarity to *E. elegans* *Jan*, Rev. et Mag. Zool., 1858, p. 524. The rings which are white 1859.]

in dissolucus, are yellow, and much narrower in elegans; the latter has a yellow ring round the neck, and the black does not extend upon the throat.

51. *E. Marcgravii?* *Neuweid.* Two sp. Dr. Wilson.
 52. *E. lemniscatus* *Schneider.*
 One sp. Surinam. Dr. Hering.
 One sp.
 53. *E. frontalis* *D. & B.*
 One sp. South America. Dr. Wilson.
 Two sp. " ?

54. *E. baliocoryphus nobis.* Body rather stout. Head broad, depressed, but still distinct. Tail short, one-fourteenth of total length. Scales in fifteen rows.

Fifteen triads of black rings four scales apart posteriorly, increasing in distance anteriorly to eight. Scales in these intervals broadly tipped with brownish black. Exterior ring of the three, two and two and a half scales wide, separated by a space of equal width from the central, which is three and four scales wide. The first ring is four scales back of the occipital plates. The scales in this interval, and the temporals are broadly tipped with black. Occipitals black, anteriorly and posteriorly edged with the light color, perhaps red in life. A spot below and in front of the eye, the superciliaries and vertical black, the last pale-edged anteriorly. Post-frontals immaculate, pre-frontals black, anteriorly light-edged; apex of rostral black. Except three black blotches on the chin, the other plates of the head are of the light color.

Gastrosteges 226; anal one, divided; urosteges 26 pairs.

Length 2 feet, 8 inches. The tail 1 inch, 9 lines.

- One sp. Buenos Ayres. Dr. Kennedy.
 This species resembles *E. lemniscatus* somewhat: it is peculiar for the shortness of the head.

55. *E. surinamensis* *Cuv.*
 One sp. Surinam. Dr. Colhoun.

2. DENDRASPIDINÆ.

Fangs without external trace of the canal.

DENDRASPIDIS Schlegel.

Verslag. Zool. genootsch. Amsterd., 1848. *Dinophis* Hallow., Proc. Acad. Nat. Sci., 1852, p. 203.

56. *D. Jamesoni* *Schlegel.* *Elaps Jamesoni* Traill, Trans. Schlegel's Essai, p. 179, 1843. *Dinophis Hammondii* Hallow., loc. cit.

Two sp. Liberia. Dr. Goheen.

In this species the superior maxillary bone is elongate, and much compressed, not offering any plane surface for the attachment of solid teeth. There is a malar process of considerable length, which is connected by ligament with the posterior frontal bone.

III. HYDROPHIDÆ.*

PLATURUS Latr.

Rept. Tome iv., p. 185.

57. *P. fasciatus* *Daudin.*
 One sp. East Indian Ocean. C. Guillou.

DISTEIRA Lacep.

Ann. Mus. Fr., iv., p. 199.

*Swainson, Fishes Amphibia, etc. Lardner's Cab. Cyc., 1839. Hydridæ, Gray, Zoolog. Miscell., 1842.

We suspect that the true ground of separation of this genus from *Hydrophis* will be found to be the separation of the frontals from the superior labials by the intervention of the fronto-nasals and preocular, and not the presence of rudimentary gastrosteges. The latter peculiarity is possessed in a less degree by *Hydrophia striata*, *H. nigrocincta*, and others. The genus thus defined would include *H. pachycercus*, *Fischer*, loc. cit., pl. 2. Should it, however, be the opinion of herpetologists that the genus be referred to *Hydrophis*, as has been done by Dr. J. G. Fischer, the species which we possess must still continue distinct, as observed by Prof. Jan, its describer.

58. *D. Dumerilii* *Jan*, Rev. et Mag. de Zoologie, 1859, p. 149. A line from the nostril to the posterior border of the fronto-nasal separates a part of it, which is analogous to the nasal. One postocular. Except two on the neck the slate-black rings are complete, and occupy three gastrosteges. The back between the rings is light slate-color. Tail slate black.
One sp. ? ?

HYDROPHIS Daud.

Hist. Rept. vii.

59. *H. Schlegeli* *Fischer*. Abhandl. der Naturwissenschaftlichen Hamburg, iii., p. 50, 1856. *Thalassophis Schlegeli* Schmidt, *ibid.* ii., p. 83, 1848. ? *Chitulia inornata* Gray, Cat. Brit. Mus., p. 56, 1849.
One sp. Manilla. Dr. Burroughs.

60. *H. gracilis* *Schlegel*. *Microcephalophis gracilis* Lesson, Voy. Belanger. Gray, Cat. Brit. Mus.
One sp. Gulf of Siam. A. A. Henderson.

61. *H. striatus* *Schlegel*.
One sp. ? ?

62. *H. pelamidoides* *Schlegel*. Fauna Japonica, 1833. *Lapemis Hardwickii*, Gray, Zool. Misc., 1842.
Four sp. Gulf of Siam. A. A. Henderson.
One sp. " " Dr. Burroughs.
One sp. Java. Capt. Harwick.
Five sp. ? ?

Two of our specimens have two postoculars on each side. One of these has a large loreal on each side. Another has two postoculars on one side, one on the other.

Var. *annulata* *Fischer*, loc. cit., pl. 3.
One sp. Manilla. Dr. Burroughs.

While our specimen coincides in all important particulars with Dr. Fischer's plate cited, it differs in having the bands of a chocolate color, each dark scale with a light shade in the middle. The body is rather more compressed than in the ordinary *pelamidoides*, and there are no traces of carination. Num *Lapemis curtus*, Gray, loc. cit.?

PELAMIS Daud.

Rept. vii., p. 366, 1802.

63. *P. bicolor* *Daud*.
Two sp. Gulf of Siam. A. A. Henderson.
One sp. Philippines. Mr. Cuming.
Four sp. East Indies. Dr. Burroughs.
Three sp. " ?
One sp. Pacific coast of Panama. Dr. J. L. Le Conte.

Total number of species :	
Viperidæ,	34
Najidæ,	22
Hydrophidæ,	7